October 5, 2022

To: Chair Marc Gorelnik and Members of the Pacific Fishery Management Council

RE: Intention to re-apply for an Exempted Fishery Permit to continue an industry initiated collaborative research project

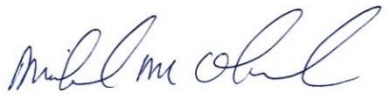
The West Coast Pelagic Conservation Group (WCP) has been working since 2017 in concert with the Southwest Fisheries Science Center (SWFSC) and the Washington Department of Fish and Wildlife (WDFW) to surveil coastal pelagic species (CPS) in nearshore northwest coastal waters.

This request for an exempted fishery permit (EFP) for Pacific sardine is submitted to continue and this industry-initiated collaborative research effort in 2023. The proposed project builds on successful work accomplished in 2017, 2019, 2021 and 2022 by the WCP and WDFW to conduct nearshore surveillance of the coastal pelagic species (CPS) assemblage off Washington, Oregon, and northern California in collaboration with the SWFSC. Our survey will continue to employ sampling methods which result in de minimis mortality for sardines and other CPS species. The PFMC most recently approved a prior request for Pacific sardine in April 2022.

The project intends to continue complementary acoustic surveying in 2023 by the FV *Lisa Marie* to quantify the CPS assemblage in waters inaccessible to the NOAA FSV *Reuben Lasker*. Accompanying the EFP proposal are attachments that outline the project's methodologies.

We thank you for this opportunity to enhance CPS research.

Sincerely,



Mike Okoniewski
Secretary, Board Member
West Coast Pelagic Conservation Group

Proposal for an Exempted Fishery Permit

West Coast Pelagic Conservation Group
Collaborative Nearshore Acoustic Survey of Washington, Oregon, and Northern California

This proposal for an exempted fishery permit (EFP) is submitted to continue an industry-initiated collaborative research effort in summer 2023. The proposed project builds on successful work accomplished in 2017, 2019, 2021, and 2022 by the West Coast Pelagic Conservation Group (WCP), the NOAA Southwest Fisheries Science Center (NOAA/SWFC), and the Washington Department of Fish and Wildlife (WDFW) to conduct nearshore surveillance of the coastal pelagic species (CPS) assemblage off Washington, Oregon, and northern California as a component of the SWFSC California Current Ecosystem Survey. The PFMC has previously approved this request in April 2019, 2020, 2021, and 2022.

1. Applicants must submit a completed application in writing that includes, but is not limited to, the following information:

a. *Date of application*: October 6, 2022

EFPs to conduct the project were approved by NOAA West Coast Region in 2019, 2020 (but not issued due to cancellation of the survey), and 2021.

b. *Applicant's names, mailing addresses, and telephone numbers*.

West Coast Pelagic Conservation Group
Mailing Address: PO Box 1104, Westport WA 98595-1104
Phones: 360-619-2019 or 360-310-0662

c. *A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP*.

The purpose of the project is to provide acoustic and biological/composition data of coastal pelagic species (CPS) inshore of the proposed 2022 NOAA/SWFSC acoustic-trawl (ATM) survey to address the lack of survey coverage of nearshore areas where CPS biomass can concentrate. The proposed project for 2023 continues the successful implementation from work first undertaken in 2017 in conjunction with the NOAA/SWFSC and the Washington Department of Fish and Wildlife (WDFW).

Surveying and sampling by an industry vessel, the F/V *Lisa Marie*, will be done concurrently with the NOAA/SWFSC survey from the Canada/US border to north/central California to overlap with and extend the nearshore transect of the NOAA research vessel. The *Lisa Marie* will be equipped with a calibrated Simrad EK-80 downsounder that will acoustically sample in order to make relative comparisons with the offshore areas surveyed by the NOAA vessel. In addition, the *Lisa Marie* will use seine gear to conduct daytime sampling of acoustically identified CPS schools to evaluate species composition and collect biological data.

The captain of the *Lisa Marie* will maintain a logbook provided by the WDFW to document set location, estimate school size, and tonnage wrapped; and, WDFW biologist(s) will assist with acoustic data collection, and direct and conduct sampling onboard. Fish will be dip-netted from wrapped schools, quantified (weighed or counted), and identified to species onboard. Samples of 50 fish per CPS species will be collected from each set for biological sampling. If necessary, some fish samples may be frozen and retained for additional analyses to be performed by NOAA or the WDFW. Wrapped schools will be released alive, and no fish will be harvested or retained for commercial purposes.

d. Valid justification explaining why issuance of an EFP is warranted.

A long-standing concern identified by CPS stock assessment reviews is associated with the spatial and temporal coverage of the NOAA/SWFSC survey. This project seeks to close the gap in our knowledge of CPS biomass and distribution by enhancing the NOAA ATM survey methodology through surveillance of the CPS in nearshore, and other adjacent areas where the NOAA survey cannot sample or survey.

The ATM survey provides the only index used for informing abundance and distribution of CPS in stock assessments. Accurate stock assessments are indispensable for the short and long-term success of the fishing industry. The ATM survey employs the latest technologies but has limitations. Due to safety concerns, the NOAA research vessels do not survey in waters less than 20-50 meters, however, CPS distribution does concentrate into waters of this depth. This is a point of concern identified by the fishing community, and in peer reviews of both the ATM survey and Pacific sardine stock assessments. Also, there is a large degree of temporal and spatial difference between detection and sampling: species sampling is limited to surface-trawl gear deployed at night, while acoustic surveying is conducted during the day. Often the surface-trawls capture very few or no fish. For years, assessment reviewers have highlighted the need for larger sample sizes in closer proximity to acoustic backscatter.

The EFP is needed because the project requires setting on CPS schools, including Pacific sardine, and the primary directed Pacific sardine fishery is closed.

e. A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.

This experimental fishing/surveillance approach could be applied to other species of fish that inhabit nearshore areas in any U.S. or Canadian waters. The techniques could be applied anywhere that additional species composition sampling would benefit fisheries survey work. Nearshore biological sampling and acoustic work may be useful to inform future stock assessment on CPS, or other species abundance, behavior, and species composition in nearshore waters where trawl sampling and deep draft vessel surveillance is not an option.

f. A statement whether the applicant intends to continue the EFP activities for more than one year. NMFS issues EFPs for only one year at a time. However, if an EFP proposal has a multi-year focus, this information should be included in the proposal.

Yes, the applicants intend to continue more than one year, contingent on funding.

g. Number of vessels and processors covered under the EFP, as well as vessel names, skipper names, and vessel ID and permit numbers.

One vessel: F/V *Lisa Marie*, Coast Guard #: 1038717; Captain: Ricky Blair, Owner: Andy Blair.

No processors will be involved in the handling of the samples unless it is to transfer samples to a location designated, and as directed, by the NOAA/SWFSC or the WDFW. There will be no commercial purchase of fish in this project.

h. A description of the species to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment; this description should include estimates of harvest impacts to non-target species.

Species wrapped and sampled may include Pacific sardine, Northern anchovy, jack mackerel, Pacific mackerel, and other CPS, and non-target species including smelts, flatfishes, cods, rockfishes, and salmon.

The project anticipates needing to retain for species composition estimates and biological sampling a maximum of 10 metric tons of Pacific sardine and 10 metric tons for all other CPS and non-target species, combined. All fish wrapped but not dip netted for sampling will be released from the seine net immediately upon completion of the dip netting.

i. A reasonable justification for the amount of EFP fish to be harvested. For statistical purposes, this could include a power analysis or other means to estimate a reasonable amount or number of fish. Any other justification that supports the amount of fish proposed for EFP activities should also be included.

The amount of fish requested under the EFP is intended to allow statistically valid sample sizes of encountered CPS to be collected per set for species composition evaluation and the collection of biological data. Data are needed to support power analyses.

The target sample size for biological sampling will be 50 fish per species per set. Following established protocols, species composition sampling will entail taking three dip netted scoops (5 to a maximum of 25 kg) per set.

The number of sets accomplished will be determined by the number of CPS schools observed, sampling protocols, and logistical constraints.

j. A description of a mechanism, such as at-sea or dockside fishery monitoring, to ensure that the harvest or impact limits for targeted and incidental species are not exceeded and are accurately accounted for and reported.

For 2023, as in all previous years, WDFW biologist(s) will be onboard the *Lisa Marie* for the duration of the survey to maintain acoustic records, complete fishing logs, monitor sets, document fish retained, and conduct species composition and biological sampling. NOAA

staff may also be onboard during concurrent acoustic survey work with the NOAA research vessel.

k. A description of the proposed data collection methods, including procedures to ensure and evaluate data quality during the experiment, and data analysis methodology and timeline of stages through completion.

See Attachment 1 for *Lisa Marie* survey plans which provides descriptions of the general data collection methods and procedures to evaluate data quality. General data collection methods and procedures will be followed for the 2023 survey.

All data and records will be provided to the NOAA/SWFSC for use at their discretion.

l. A description of how vessels will be chosen to participate in the EFP.

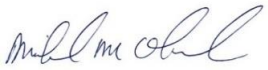
The *Lisa Marie* was chosen based on dialogue with the NOAA survey team about the type and size of vessel, availability, and a history of conducting research. The vessel selection was supported by members of West Coast Pelagic Conservation Group.

m. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will occur, and the type, size, and amount of gear to be used.

The *Lisa Marie* will survey the nearshore waters of Washington, Oregon, and northern California following a schedule determined the SWFSC survey team of likely no more than 30 days during a window between mid-June and late-August. Exact time and dates will be dependent on the NOAA research vessel schedule.

The *Lisa Marie* will deploy a seine net that is 230 fathoms in length, 2800 meshes deep, with a mesh size of 11/16.

n. The signature of the applicant.



Michael M. Okoniewski
Board Member
West Coast Pelagic Conservation Group

Attachment 1

Nearshore Acoustic and Purse Seine Sampling-WA, OR, and northern CA (F/V *Lisa Marie*)

Excerpted from Southwest Fisheries Science Center Project Instructions for the California Current Ecosystem Survey (CCES)

All specific dates are included as examples only, actual 2023 dates will be determined later. This document is intended to meet the need to describe survey methods for the EFP application.

Overview

During summer, NOAA Ship *Lasker* will be used by Southwest Fisheries Science Center (SWFSC) Fisheries Resources Division (FRD) to survey the distributions and abundances of coastal pelagic fish species (CPS), their prey, and their biotic and abiotic environments in the California Current between Vancouver Island and Baja California Norte. Routinely, *Lasker* will only survey in water depths greater than ~ 20 to 30 m, and therefore may potentially under-sample any CPS aggregations in the shallower, *nearshore area*. Therefore, to extend the CPS sampling closer to shore, Fishing Vessel *Lisa Marie* (LM) will be used to conduct echosounder and purse-seine sampling as close to shore as safely navigable, from Cape Flattery, WA to Bodega Bay, CA.

ITINERARY - F/V *Lisa Marie* (Example only)

Event	**Location**	**Date(s)**	**Sea days**	**Port days**
Mobilization/ Calibration	Newport, OR	4-June		
Departure	Westport, WA	13 Jul		
Leg 1		14-22 Jul	9	
Port call	Newport, OR	22-26 Jul		5
Leg 2		27 Jul-7 Aug.	12	
Arrive	Westport, WA	7 Aug.		
Demobilization	Westport, WA	TBD		

The principle components of the nearshore sampling include: Advanced Survey Technology Program's (AST's) Simrad EK60 General Purpose Transceiver (GPT) connected to *Lisa Marie*'s Simrad 38 kHz transducer (ES38-B); and biologists from Washington Department of Fish and Wildlife (WDFW) to collect the acoustic data, direct purse-seine sets on CPS, and catches aboard *Lisa Marie* and ashore (**Fig. 1**).

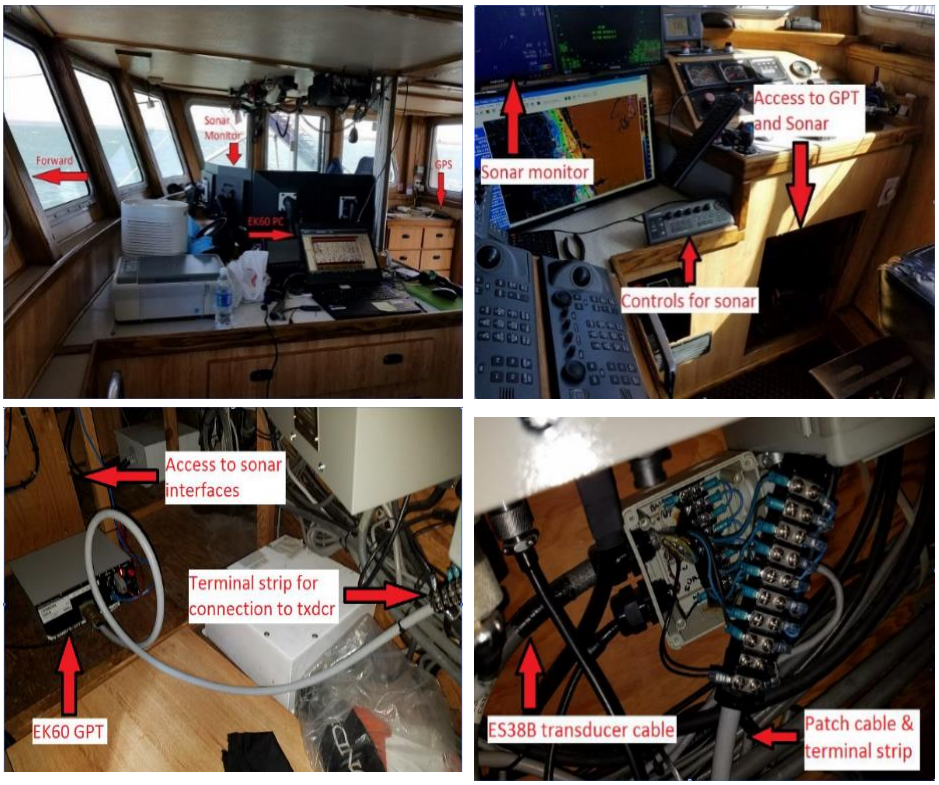


Figure 1. The bridge of *Lisa Marie* where the EK60 controlling and logging laptop is located. A table located to the port side of the helm station, behind the array of instrumentation and monitors (top left); the EK60 GPT and Furuno CH-250 sonar transceiver installed under the main console in the wheelhouse (top right); the EK60 GPT attached to the deck with Velcro (bottom left); and the transducer patch cable connected to the transducer through a terminal strip in a junction box (bottom right).

The echosounder system will be used to sample acoustic backscatter from CPS along transects between the 5 and 60-m isobaths, spaced 5 nmi apart (**Fig. 2**). *Lisa Marie* will also sample CPS using purse-seine sets in the nearshore area. A biologist from the WDFW will be aboard *Lisa Marie* to log EK60 data; direct the purse-seine sampling of CPS; sample the catches, and maintain a log of all observations and sampling activities. To ensure that the samplings from *Lasker* and *Lisa Marie* are contemporaneous, the acoustician aboard *Lasker* will communicate and coordinate with the WDFW biologists throughout the survey. Following the survey, biologists from the WDFW will complete the processing of samples from the purse seine catches to obtain information about the proportions of species in the area, their lengths, weights, and ages (estimated from otoliths).

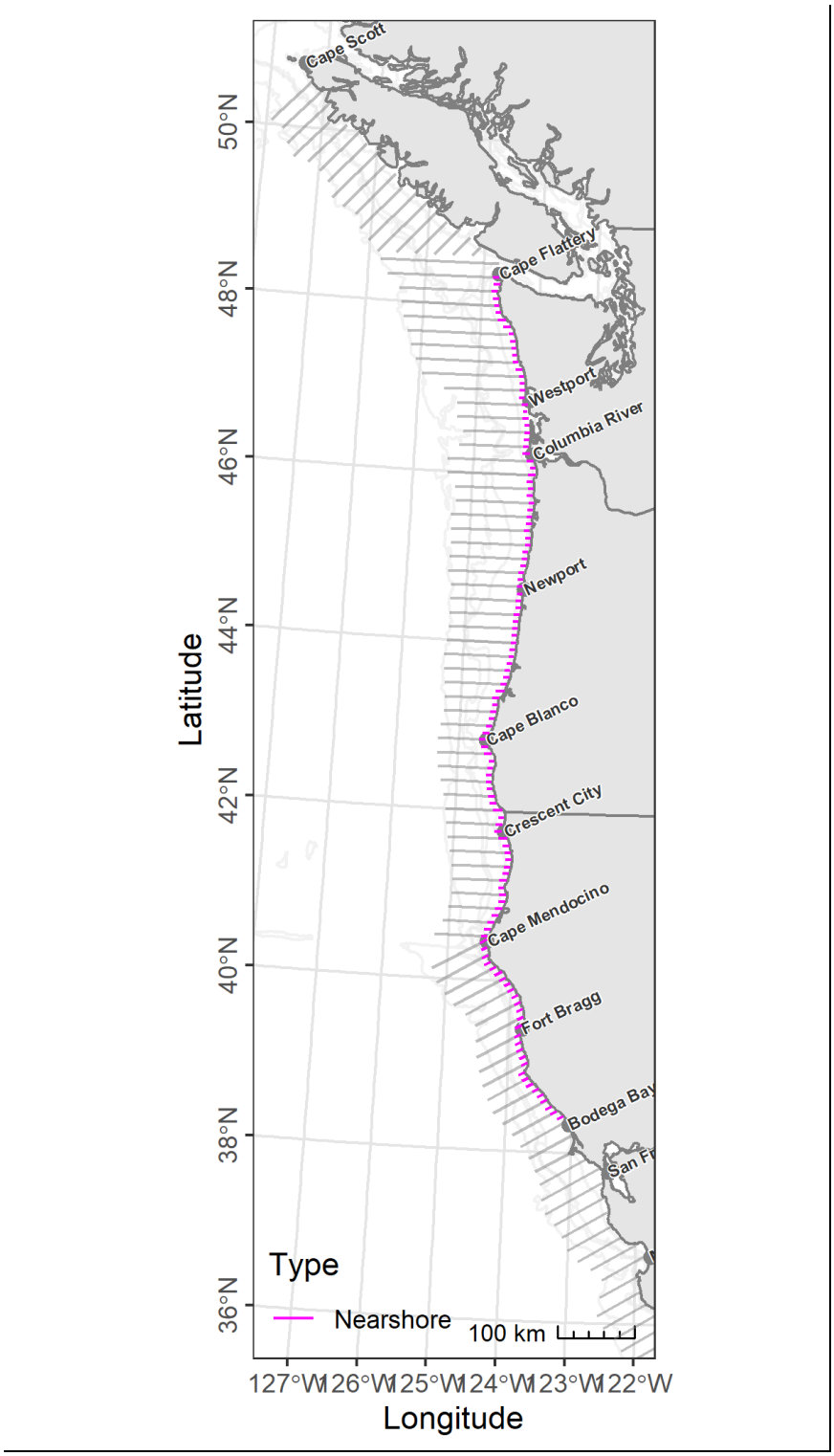


Figure 2. *Lisa Marie's* nearshore transects (magenta lines) and compulsory, adaptive, and unmanned surface vehicle (USV) transects (gray lines). The waypoints for the nearshore transects are in **Table 1**. All vessels will run the transects as close to shore as safely navigable. Purse seine sampling may be restricted in marine protected areas (MPAs) off the WA and OR coast (see **Figures 3-5**).

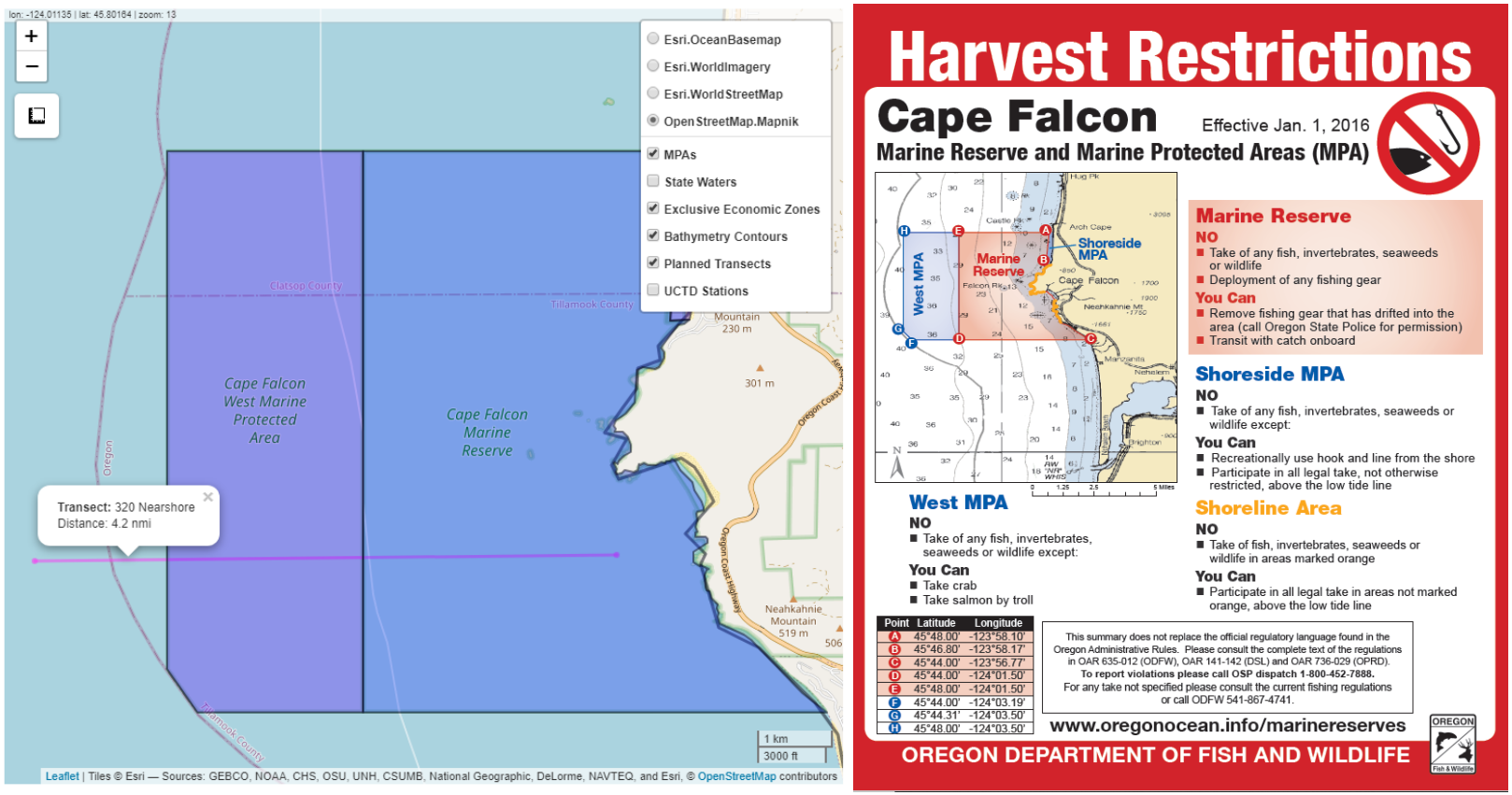


Figure 3. Map showing Cape Falcon Marine Protected Area (MPA) and Marine Reserve (MR), near Manzanita, OR. Planned nearshore transect 320 intersects these protected areas (left). Take is restricted in these Marine Protected Areas (right).

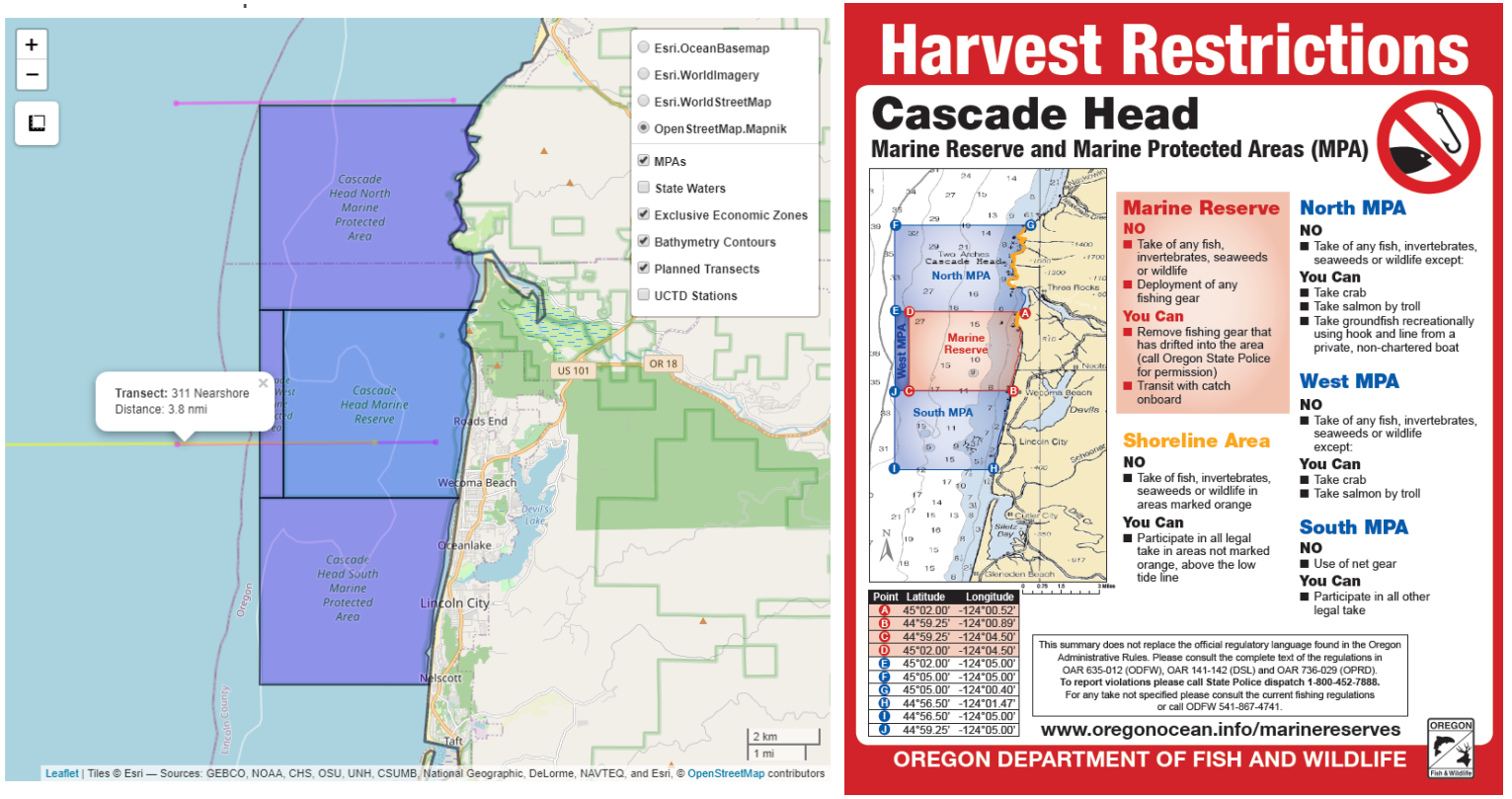


Figure 4. Map showing Cascade Head Marine Protected Area (MPA) and Marine Reserve (MR), near Lincoln City, OR. Planned nearshore transect 311 and 312 intersect these protected areas. Take is restricted in these Marine Protected Areas (right).

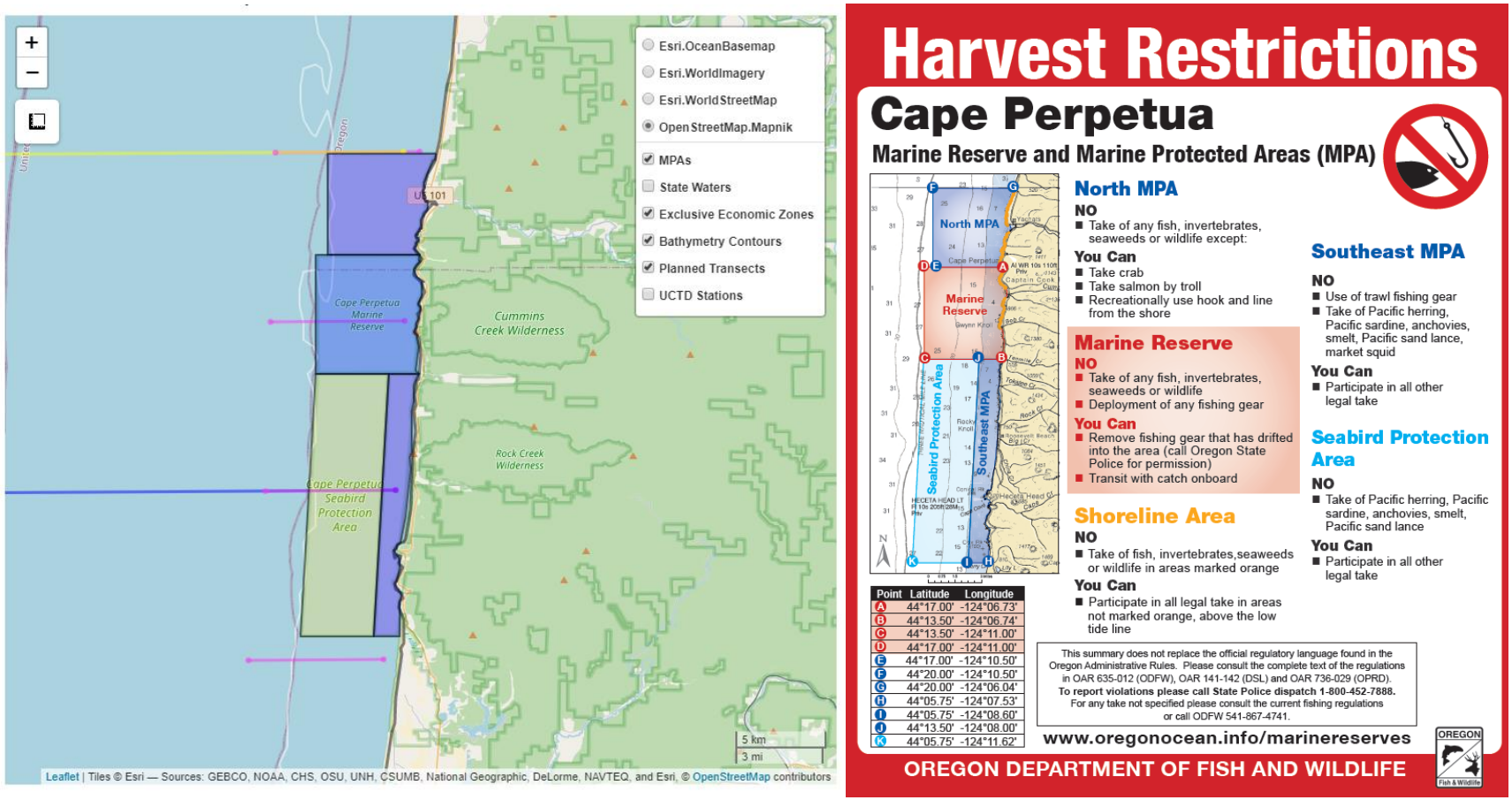


Figure 5. Map showing Cape Perpetua Marine Protected Area (MPA) and Marine Reserve (MR), off Heceta Head near Yachats, OR. Planned nearshore transects 301-303 intersect these protected areas. Take is restricted in these Marine Protected Areas (right).

Methods

During June, SWFSC staff will install, test, and calibrate the EK60 recording system (principally the GPT, a GPS receiver, and control and logging laptop PC) on *Lisa Marie* in Newport, OR. During this time, SWFSC staff and Captain Ricky Blair will test the echosounder system's function and evaluate any crosstalk between the vessel's sonar and the echosounder.

On 13 July, *Lisa Marie* will depart from Westport, WA and transit to the first planned transect off Cape Flattery. Between 14 July and 6 August, *Lisa Marie* will conduct acoustic transects and purse-seine sets on transects spanning the nearshore region from Cape Flattery to Bodega Bay. To maintain progress with *Lasker*, *Lisa Marie* will call port in Newport Bay, OR from 22-26 July.

Upon completion of sampling on August 6, *Lisa Marie* will transit to Westport, WA where demobilization will occur. As all biological sampling will occur aboard, final data will be submitted to the SWFSC upon completion of QA/QC procedures; raw biological data will be routinely delivered to the lead SWFSC scientist as the survey is underway. (

Lisa Marie will conduct the nearshore survey (~1300 nmi total transect distance; ~1900 nmi total distance, including transits before and after the survey) transiting at nominally 8 kn, running transects at 7 kn, and purse-seine sampling for at least 3 hours each day. Activities will occur following the provisional schedule in **Table A1**, including 3 transit days, 2 contingency days, 5 days in port, and 17 survey days.

Table 1. Provisional schedule for F/V *Lisa Marie*.

Date	Day	First Transect	Last Transect
July 14	1	Transit	
July 15	2	351	343
July 16	3	342	334
July 17	4	333	325
July 18	5	324	316
July 19	6	315	307
July 20	7	306	299
July 21	8	298	291
July 22	9	Contingency	
July 23		In port,Winchester Bay OR	
July 24		In port,Winchester Bay OR	
July 25		In port,Winchester Bay OR	
July 26		In port,Winchester Bay OR	
July 27		In port,Winchester Bay OR	
July 28	10	290	283
July 29	11	282	275
July 30	12	274	267
July 31	13	266	259
August 1	14	258	252
August 2	15	251	245
August 3	16	244	238
August 4	17	237	231
August 5	18	230	224
August 6	19	Contingency	
August 7	20	Transit	
August 8	21	Transit	

Acoustic Sampling

Lisa Marie is expected to begin sampling nearshore transects Cape Flattery and continue south to Bodega Bay (**Fig. 2**). A total of 128 transect lines nominally 4 nmi-long are spaced 5 nautical miles apart. Each day has 6 or 7 transects (north of Newport) or 5 or 6 transects (south of Newport). At 7 kn, acoustic sampling would consume 7.5-10.5 hours per day, which will leave a minimum of 5 hours of daylight per day for purse seine sampling. Acoustic sampling of each transect is expected to occur on a straight line between the waypoints (**Table 2**). Transects may be run in either direction, west-east or east-west. Deviations from these transect lines should be minimized.

Purse Seine Sampling

Each day, after transects have been surveyed, *Lisa Marie* will collect CPS samples by fishing a purse-seine net on randomly selected CPS schools observed in echograms. The samples will be used to determine the species composition of CPS schools and to obtain biological information including weight, length, maturity, and age (using extracted otoliths).

The net is approximately 440 m-long and 40 m-deep net with 17 mm-wide mesh (A. Blair, pers. comm.). *Lisa Marie* will set the net at least 3 times per day (~ 1 h per set), to collect at least 51 sets over the course of the survey. The seine will generally be set only during daytime. However, in areas where an abundance of schools is observed, daytime sets are not successful, or both, a set may be made at night.

To the extent possible, and to the best ability of the captain and crew, the date, time, location, and species composition of all putative CPS schools observed (acoustically and visually) shall be logged. Each day, the WDFW biologists will use these observations to direct the purse seine sampling effort such that the catches are proportional to the species composition of the schools observed acoustically that day.

The space is sufficient on the F/V *Lisa Marie* to allow WDFW staff to process samples onboard. Sample collection will be done by fishermen and the WDFW biologists and processing will begin following completion of the set. Depending on the quantity of samples and interval between sets, some samples may be labeled for freezing to process at a later time, either while still on board or after ashore. Final processing if needed, and all ageing of otoliths will be conducted ashore by WDFW staff. All biological sampling gear will be brought aboard by WDFW biologists.

The following protocols will be followed for the processing of catch from each set:

WDFW Biologist at sea,

- For every set, collect three (3) dip net samples, separated spatially as much as possible in the seine net
- For each dip net sample, sort fish to species, enumerate, and weigh
- Once each dip net sample is processed to species, combine all samples to the species and collect a random sample of 50 specimens per species, collect a combined weight
    - Record length (standard for sardine and anchovy, fork for all other species) to the nearest millimeter, weight in grams, record macroscopic maturity (any CPS), and collect age structures (any CPS or groundfish)
- Catch and biological data will be shared with SWFSC for analysis

The visual monitoring watches (from 15 min prior to set through gear retrieval) and any data gathered during these watches will be recorded in the watch logs provided for each survey. The net will not be opened if only pinnipeds enter it. If any dolphins or porpoises are seen within 500 m of the vessel, the move-on rule is applied. If killer whales are seen at any distance, the move-on rule is applied. If any cetaceans are seen within the net it is opened immediately.

a) Coordination and Data Exchange

Conditions permitting, *Lisa Marie* and *Lasker* will communicate daily with the acousticians aboard *Lasker* to exchange information and maintain temporal and spatial coherence of the samples. If daily encounters are not possible, or even if a larger than 3-day mismatch occurs between *Lisa Marie* and *Lasker*, *Lisa Marie* will continue the sampling protocol independently of *Lasker*, at a rate of approximately 6-7 transects per day for the remaining available time.

At the conclusion of the nearshore survey aboard *Lisa Marie*, WDFW Biologistswill disembark *Lisa Marie* at Westport, WA. Logbook and results of the sample processing will be provided by WDFW biologists to the AST to estimate and report the nearshore CPS biomasses and distributions.

b) Echosounder equipment

EK60 System
The EK60 system is comprised of four GPTs operating at 38, 70, 120, and 200 kHz, four pole-mounted split-beam transducer (Simrad ES38-12, ES70-7C, ES120-7C, and ES200-7C), AC or DC power, a connection to the ship's ground, synchronization with other sounders and sonars, and an Ethernet connection to a laptop PC running Simrad ER60 control and data logging software. In this installation, the temperature sensor, event input, motion sensor, new line, and remote on/off inputs will not be used.

Transducers
The ES38-B transducer, mounted in the hull of Lisa Marie, is connected, via a terminal strip in a junction box on the bridge, to the GPT using an 11-pin Amphenol connector.

Power
The GPTs may be powered by either 110 AC or 12 VDC/7A. To reduce noise in the echosounder data, use a power strip with line filter.

Ground
The GPT chassis must be connected to the ship's ground using a cable that is as short as possible.

ER60 Computer
The EK60s will be controlled, and their data will be logged, using a laptop PC running Simrad EK80 software. Data will be backed-up to USB hard disk drives (HDDs). The EK60 GPTs and controlling and data-logging laptop will be located on the bridge of *Lisa Marie*. The laptop will be connected directly to the EK60 GPTs via an Ethernet cable; and to a GPS receiver via a USB-to-serial adapter.

Ethernet
The GPTs and laptop are connected using "straight through" Ethernet cables and an Ethernet switch.

GPS Data
NMEA 0183 data from a GPS receiver must be input to the laptop via a USB-serial adapter. The communication parameters are 4800 bps, 8 data bits, no parity, and one stop bit. The GPS's serial output signal (Tx, pin 3) and ground (pin 5) wires must be connected to the laptop's serial input signal (Rx, pin 2) and ground (pin 5) wires using a maximum cable length of 10 m.

A GPS receiver will be installed with an antenna running outside and on top of the cabin, or affixed to the inside of the port-side bridge window.

EK60 System Calibration and Configuration
The EK60 system will be configured for operation with a transmit power of 2000 W, pulse length of 1024 μs, and the ping rate will be optimized using EK Adaptive Logging (EAL) software. With the EAL, the nominal transmit interval will be 0.5 Hz.

Prior to the survey, the EK60 system must be calibrated relative to a sphere made from tungsten carbide with 6% cobalt binder material, suspended directly beneath the transducer, at a range of more than 7 m, using two or three lengths of fishing line. The lines may be controlled manually. This procedure requires two people on deck and one on the bridge observing the ER60 display.

Prior to the calibration, the transducer face must be cleaned of all biofouling, and the local water temperature and salinity must be measured to estimate sound speed and absorption coefficients.

a). Cross-talk Interference

Prior to the survey, noise in the EK60 data, originating from operation of *Lisa Marie's* depth sounder and fishing sonar, must be evaluated and mitigated. To evaluate crosstalk noise from the depth sounder and sonar and depth sounder, the EK60 GPT will be set in passive mode and noise measurements will be collected with the depth sounder turned on and then off, and then the sonar turned on and then off.

Note: Prior to the 2017 survey aboard *Lisa Marie*, tests indicated that both the sonar and the depth sounder caused significant noise in the EK60 signal. If noise testing cannot be repeated prior to the summer 2021 nearshore survey, or if the crosstalk has not been mitigated since 2017, both the sonar and the depth sounder should remain off during the daytime E-W transects of the nearshore survey.

To avoid interference during the survey transects, *Lisa Marie*'s depth sounder and fishing sonar must be secured. However, during transits and fishing operations, the depth sounder and fishing sonar may be used to observe near-surface fish schools.

Contact list

Last Name	First Name	Affiliation	Phone	Email
Blair	Andrew	F/V Lisa Marie, owner	253-219-4277	Neworegon14@aolcom
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Johnson	Gabriel	SWFSC, AST	609-707-5556	Gabriel.johnson@noaa.gov
Mau	Scott	SWFSC, AST	858-546-5645	Scott.mau@noaa.gov
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Phillip	Dionne	WDFW	360-628-7068	Phillip.Dionne@dfw.wa.gov
Reinikka	Dave	J&G Marine Supply	253-572-4217	daver@jgmarinesupply.com
Renfree	Josiah	SWFSC, AST	858-232-3121	Josiah.renfree@noaa.gov
Reynaga	Andrew	NOAA Corps, *Lasker*	619-230-0331	Ops.reuben.lasker@noaa.gov
Sessions	Steve	SWFSC, AST	206-390-8872	Steve.sessions@noaa.gov
Shaughnessy	Greg	Ocean Gold Seafoods, Inc.	360-310-0662	Gshaughnessy@oceancos.com
Stierhoff	Kevin	SWFSC, AST	808-225-0106	Kevin.stierhoff@noaa.gov
Tsou	Tien-Shui	WDFW	360-790-1518	Tien-Shui.Tsou@dfw.wa.gov
Wargo	Lorna	WDFW	360.581.5611	Lorna.Wargo@dfw.wa.gov
Zwolinski	Juan	SWFSC, AST	619-794-8824	Juan.zwolinski@noaa.gov

Equipment list

Equipment / Supply	Quantity	Responsibility
EK60 GPTs (with AC power cables)	1	AST
Line-conditioning power strips	2	AST
GPT ground cable	1	AST
GPT 110V AC power source	1	*Lisa Marie*
MTA-4 Transducer array (ES38-12, ES70-7C, ES120-7C, ES200-7C)	1	AST
Pole-mount (pole, gunnel-mount swivel, and water-line receiver cup)	1	AST
Transducer cables and Amphenol connector (6')	1	AST
EK80 Laptop PC (and spare)	2	AST
USB-Serial adapter (and spare)	2	AST
2-TB USB HDDs (and spare)	2	AST
Handheld GPS receiver, antennae, PS (backup)	2	AST
Male DB-9 serial plug (and spare) for GPS input	2	AST
Male DB-25 serial plug (and spare) for auxiliary	2	AST
"Crossover" Ethernet cable (and spare)	2	AST
"Straight through" Ethernet cables (backup)	2	AST
Four-port Ethernet switch and PS (backup)	1	AST
Surge suppressor/line filter power strip (and spare)	2	AST
Extension cord (and spare)	2	AST
Furuno 250 sonar	1	F/V *Lisa Marie*

Synchronize *Lisa Marie*'s sounders and sonar from GPT Auxiliary	1	J&G Marine Supply
38.1-mm diameter WC (6% Co) sphere (and spare)	2	AST
Reel, ~20 lb test monofilament line	1	AST
Handheld VHF radios and charger	3	AST
YSI Pro2030 probe	1	AST

Transect waypoints for F/V *Lisa Marie*

Table 2. Planned nearshore transect waypoints for *Lisa Marie*.

Transect	Waypoint	Latitude	Longitude	Type	Region	Depth	Vessel
228	228.1N	38.366463	-123.096827	Nearshore	Central CA	-19	*Lisa Marie*
228	228.2N	38.324221	-123.185683	Nearshore	Central CA	-89	*Lisa Marie*
229	229.1N	38.434838	-123.133675	Nearshore	Central CA	-15	*Lisa Marie*
229	229.2N	38.392812	-123.225998	Nearshore	Central CA	-87	*Lisa Marie*
230	230.1N	38.49127	-123.239046	Nearshore	Central CA	-52	*Lisa Marie*
230	230.2N	38.448615	-123.330082	Nearshore	Central CA	-99	*Lisa Marie*
231	231.1N	38.549066	-123.314069	Nearshore	Central CA	-1	*Lisa Marie*
231	231.2N	38.50594	-123.407921	Nearshore	Central CA	-111	*Lisa Marie*
232	232.1N	38.622512	-123.384519	Nearshore	Central CA	-37	*Lisa Marie*
232	232.2N	38.57921	-123.476049	Nearshore	Central CA	-103	*Lisa Marie*
233	233.1N	38.688391	-123.445215	Nearshore	Central CA	-5	*Lisa Marie*
233	233.2N	38.645901	-123.537471	Nearshore	Central CA	-100	*Lisa Marie*
234	234.1N	38.747655	-123.522007	Nearshore	Central CA	1	*Lisa Marie*
234	234.2N	38.704709	-123.614627	Nearshore	Central CA	-104	*Lisa Marie*
235	235.1N	38.806242	-123.606715	Nearshore	Central CA	-30	*Lisa Marie*
235	235.2N	38.763231	-123.701239	Nearshore	Central CA	-111	*Lisa Marie*
236	236.1N	38.872298	-123.682178	Nearshore	Central CA	-29	*Lisa Marie*
236	236.2N	38.830201	-123.771904	Nearshore	Central CA	-110	*Lisa Marie*
237	237.1N	38.937441	-123.738341	Nearshore	Central CA	-8	*Lisa Marie*
237	237.2N	38.894938	-123.83103	Nearshore	Central CA	-107	*Lisa Marie*
238	238.1N	39.053246	-123.70238	Nearshore	Central CA	-15	*Lisa Marie*
238	238.2N	39.009931	-123.796555	Nearshore	Central CA	-70	*Lisa Marie*
239	239.1N	39.130432	-123.738956	Nearshore	Central CA	-22	*Lisa Marie*
239	239.2N	39.088206	-123.831431	Nearshore	Central CA	-96	*Lisa Marie*
240	240.1N	39.211597	-123.781019	Nearshore	Central CA	6	*Lisa Marie*
240	240.2N	39.168686	-123.873842	Nearshore	Central CA	-117	*Lisa Marie*
241	241.1N	39.295142	-123.807024	Nearshore	Central CA	0	*Lisa Marie*
241	241.2N	39.253322	-123.899054	Nearshore	Central CA	-132	*Lisa Marie*
242	242.1N	39.38628	-123.823872	Nearshore	Central CA	4	*Lisa Marie*
242	242.2N	39.343195	-123.916443	Nearshore	Central CA	-133	*Lisa Marie*
243	243.1N	39.490667	-123.811266	Nearshore	Central CA	0	*Lisa Marie*
243	243.2N	39.446758	-123.904126	Nearshore	Central CA	-112	*Lisa Marie*
244	244.1N	39.591102	-123.795302	Nearshore	Central CA	-15	*Lisa Marie*

244	244.2N	39.549175	-123.886923	Nearshore	Central CA	-119	*Lisa Marie*
245	245.1N	39.685187	-123.805904	Nearshore	Central CA	-6	*Lisa Marie*
245	245.2N	39.642525	-123.898882	Nearshore	Central CA	-128	*Lisa Marie*
246	246.1N	39.766253	-123.843031	Nearshore	Central CA	57	*Lisa Marie*
246	246.2N	39.723218	-123.937259	Nearshore	Central CA	-143	*Lisa Marie*
247	247.1N	39.842626	-123.891659	Nearshore	Central CA	-23	*Lisa Marie*
247	247.2N	39.80037	-123.984541	Nearshore	Central CA	-151	*Lisa Marie*
248	248.1N	39.915141	-123.956058	Nearshore	Central CA	-9	*Lisa Marie*
248	248.2N	39.871737	-124.04863	Nearshore	Central CA	-108	*Lisa Marie*
249	249.1N	39.983026	-124.013957	Nearshore	Central CA	53	*Lisa Marie*
249	249.2N	39.941114	-124.107413	Nearshore	Central CA	-84	*Lisa Marie*
250	250.1N	40.043548	-124.08597	Nearshore	Central CA	-17	*Lisa Marie*
250	250.2N	40.000803	-124.179047	Nearshore	Central CA	-139	*Lisa Marie*
251	251.1N	40.108858	-124.146896	Nearshore	Central CA	-43	*Lisa Marie*
251	251.2N	40.058772	-124.255921	Nearshore	Central CA	-231	*Lisa Marie*
252	252.1N	40.163499	-124.241684	Nearshore	Central CA	-10	*Lisa Marie*
252	252.1N	40.118693	-124.339309	Nearshore	Central CA	-359	*Lisa Marie*
253	253.1N	40.220878	-124.330645	Nearshore	Central CA	-10	*Lisa Marie*
253	253.1N	40.179101	-124.421759	Nearshore	Central CA	-402	*Lisa Marie*
254	254.1N	40.302887	-124.365971	Nearshore	Central CA	-18	*Lisa Marie*
254	254.2N	40.258241	-124.463437	Nearshore	Central CA	-100	*Lisa Marie*
255	255.1N	40.389448	-124.391382	Nearshore	Central CA	-16	*Lisa Marie*
255	255.2N	40.35138	-124.474568	Nearshore	Central CA	-115	*Lisa Marie*
256	256.1N	40.482934	-124.401656	Nearshore	Central CA	-12	*Lisa Marie*
256	256.2N	40.434002	-124.508687	Nearshore	Central CA	-48	*Lisa Marie*
257	257.1N	40.520401	-124.391169	Nearshore	Central CA	-1	*Lisa Marie*
257	257.2N	40.520226	-124.485245	Nearshore	Central CA	-49	*Lisa Marie*
258	258.1N	40.603162	-124.34501	Nearshore	Central CA	-1	*Lisa Marie*
258	258.2N	40.60296	-124.449697	Nearshore	Central CA	-59	*Lisa Marie*
259	259.1N	40.685953	-124.291323	Nearshore	Central CA	-1	*Lisa Marie*
259	259.2N	40.685727	-124.403472	Nearshore	Central CA	-41	*Lisa Marie*
260	260.1N	40.768763	-124.235248	Nearshore	Central CA	0	*Lisa Marie*
260	260.2N	40.768524	-124.349174	Nearshore	Central CA	-52	*Lisa Marie*
261	261.1N	40.851582	-124.182316	Nearshore	Central CA	0	*Lisa Marie*
261	261.2N	40.851339	-124.293853	Nearshore	Central CA	-62	*Lisa Marie*
262	262.1N	40.934384	-124.143682	Nearshore	Central CA	0	*Lisa Marie*
262	262.2N	40.934153	-124.245897	Nearshore	Central CA	-55	*Lisa Marie*
263	263.1N	41.015298	-124.134583	Nearshore	Central CA	-8	*Lisa Marie*
263	263.2N	41.015012	-124.237004	Nearshore	Central CA	-54	*Lisa Marie*
264	264.1N	41.09977	-124.173173	Nearshore	Central CA	-3	*Lisa Marie*
264	264.2N	41.099558	-124.260599	Nearshore	Central CA	-70	*Lisa Marie*
265	265.1N	41.182602	-124.134983	Nearshore	Central CA	-10	*Lisa Marie*
265	265.2N	41.182307	-124.25303	Nearshore	Central CA	-81	*Lisa Marie*

266	266.1N	41.265429	-124.104096	Nearshore	Central CA	-6	*Lisa Marie*
266	266.2N	41.265171	-124.204093	Nearshore	Central CA	-63	*Lisa Marie*
267	267.1N	41.3464	-124.093291	Nearshore	Central CA	0	*Lisa Marie*
267	267.2N	41.346541	-124.183257	Nearshore	Central CA	-58	*Lisa Marie*
268	268.1N	41.431029	-124.076291	Nearshore	Central CA	-1	*Lisa Marie*
268	268.2N	41.430788	-124.164105	Nearshore	Central CA	-45	*Lisa Marie*
269	269.1N	41.513759	-124.092337	Nearshore	Central CA	-13	*Lisa Marie*
269	269.2N	41.51349	-124.187838	Nearshore	Central CA	-47	*Lisa Marie*
270	270.1N	41.596469	-124.117581	Nearshore	Central CA	-13	*Lisa Marie*
270	270.2N	41.596183	-124.216557	Nearshore	Central CA	-44	*Lisa Marie*
271	271.1N	41.679159	-124.151254	Nearshore	Central CA	-9	*Lisa Marie*
271	271.2N	41.678746	-124.289853	Nearshore	Central CA	-56	*Lisa Marie*
272	272.1N	41.76166	-124.247474	Nearshore	Central CA	-2	*Lisa Marie*
272	272.2N	41.761311	-124.36171	Nearshore	Central CA	-78	*Lisa Marie*
273	273.1N	41.8445	-124.23398	Nearshore	Central CA	-1	*Lisa Marie*
273	273.2N	41.844155	-124.343693	Nearshore	Central CA	-15	*Lisa Marie*
274	274.1N	41.927365	-124.216024	Nearshore	Central CA	-4	*Lisa Marie*
274	274.2N	41.927072	-124.307206	Nearshore	Central CA	-33	*Lisa Marie*
275	275.1N	42.010092	-124.243536	Nearshore	WA/OR	-13	*Lisa Marie*
275	275.2N	42.009586	-124.397197	Nearshore	WA/OR	-82	*Lisa Marie*
276	276.1N	42.092551	-124.352121	Nearshore	WA/OR	-35	*Lisa Marie*
276	276.2N	42.092196	-124.457334	Nearshore	WA/OR	-98	*Lisa Marie*
277	277.1N	42.175309	-124.372052	Nearshore	WA/OR	-6	*Lisa Marie*
277	277.2N	42.174937	-124.479687	Nearshore	WA/OR	-101	*Lisa Marie*
278	278.1N	42.257974	-124.420286	Nearshore	WA/OR	-9	*Lisa Marie*
278	278.2N	42.257649	-124.512051	Nearshore	WA/OR	-112	*Lisa Marie*
279	279.1N	42.340735	-124.442481	Nearshore	WA/OR	-3	*Lisa Marie*
279	279.2N	42.34041	-124.532197	Nearshore	WA/OR	-98	*Lisa Marie*
280	280.1N	42.423579	-124.444159	Nearshore	WA/OR	-1	*Lisa Marie*
280	280.2N	42.42323	-124.538475	Nearshore	WA/OR	-65	*Lisa Marie*
281	281.1N	42.506498	-124.428944	Nearshore	WA/OR	1	*Lisa Marie*
281	281.2N	42.506155	-124.519506	Nearshore	WA/OR	-37	*Lisa Marie*
282	282.1N	42.589439	-124.411387	Nearshore	WA/OR	-2	*Lisa Marie*
282	282.2N	42.589084	-124.503164	Nearshore	WA/OR	-63	*Lisa Marie*
283	283.1N	42.671226	-124.459204	Nearshore	WA/OR	-30	*Lisa Marie*
283	283.2N	42.67113	-124.581413	Nearshore	WA/OR	-95	*Lisa Marie*
284	284.1N	42.754758	-124.526713	Nearshore	WA/OR	-2	*Lisa Marie*
284	284.2N	42.754354	-124.627235	Nearshore	WA/OR	-74	*Lisa Marie*
285	285.1N	42.83747	-124.572362	Nearshore	WA/OR	-5	*Lisa Marie*
285	285.2N	42.837083	-124.666711	Nearshore	WA/OR	-83	*Lisa Marie*
286	286.1N	42.920658	-124.505217	Nearshore	WA/OR	-1	*Lisa Marie*
286	286.2N	42.920186	-124.618307	Nearshore	WA/OR	-78	*Lisa Marie*
287	287.1N	43.003746	-124.46696	Nearshore	WA/OR	-5	*Lisa Marie*

287	287.2N	43.003312	-124.568872	Nearshore	WA/OR	-88	*Lisa Marie*
288	288.1N	43.08678	-124.445486	Nearshore	WA/OR	0	*Lisa Marie*
288	288.2N	43.086395	-124.534093	Nearshore	WA/OR	-80	*Lisa Marie*
289	289.1N	43.169849	-124.419528	Nearshore	WA/OR	-4	*Lisa Marie*
289	289.2N	43.169429	-124.514711	Nearshore	WA/OR	-62	*Lisa Marie*
290	290.1N	43.252905	-124.400412	Nearshore	WA/OR	-7	*Lisa Marie*
290	290.2N	43.252489	-124.492822	Nearshore	WA/OR	-61	*Lisa Marie*
291	291.1N	43.335966	-124.383456	Nearshore	WA/OR	-5	*Lisa Marie*
291	291.2N	43.336057	-124.498101	Nearshore	WA/OR	-94	*Lisa Marie*
292	292.1N	43.419357	-124.299363	Nearshore	WA/OR	-2	*Lisa Marie*
292	292.2N	43.418709	-124.438425	Nearshore	WA/OR	-100	*Lisa Marie*
293	293.1N	43.502534	-124.265867	Nearshore	WA/OR	-8	*Lisa Marie*
293	293.2N	43.502045	-124.369179	Nearshore	WA/OR	-101	*Lisa Marie*
294	294.1N	43.585719	-124.234754	Nearshore	WA/OR	-3	*Lisa Marie*
294	294.2N	43.585258	-124.330451	Nearshore	WA/OR	-98	*Lisa Marie*
295	295.1N	43.668822	-124.224354	Nearshore	WA/OR	-5	*Lisa Marie*
295	295.2N	43.668405	-124.309427	Nearshore	WA/OR	-100	*Lisa Marie*
296	296.1N	43.752041	-124.193641	Nearshore	WA/OR	-1	*Lisa Marie*
296	296.2N	43.751583	-124.285698	Nearshore	WA/OR	-97	*Lisa Marie*
297	297.1N	43.835217	-124.175449	Nearshore	WA/OR	-2	*Lisa Marie*
297	297.2N	43.834773	-124.263043	Nearshore	WA/OR	-79	*Lisa Marie*
298	298.1N	43.91839	-124.160927	Nearshore	WA/OR	-1	*Lisa Marie*
298	298.2N	43.917944	-124.247851	Nearshore	WA/OR	-70	*Lisa Marie*
299	299.1N	44.001569	-124.148921	Nearshore	WA/OR	0	*Lisa Marie*
299	299.2N	44.001103	-124.238014	Nearshore	WA/OR	-68	*Lisa Marie*
300	300.1N	44.084766	-124.136421	Nearshore	WA/OR	-2	*Lisa Marie*
300	300.2N	44.084275	-124.229071	Nearshore	WA/OR	-58	*Lisa Marie*
301	301.1N	44.167956	-124.128517	Nearshore	WA/OR	9	*Lisa Marie*
301	301.2N	44.167475	-124.21793	Nearshore	WA/OR	-60	*Lisa Marie*
302	302.1N	44.251157	-124.121845	Nearshore	WA/OR	-2	*Lisa Marie*
302	302.2N	44.250653	-124.214045	Nearshore	WA/OR	-54	*Lisa Marie*
303	303.1N	44.334391	-124.11218	Nearshore	WA/OR	66	*Lisa Marie*
303	303.2N	44.333846	-124.210476	Nearshore	WA/OR	-56	*Lisa Marie*
304	304.1N	44.417709	-124.090588	Nearshore	WA/OR	12	*Lisa Marie*
304	304.2N	44.417179	-124.184907	Nearshore	WA/OR	-51	*Lisa Marie*
305	305.1N	44.500905	-124.094069	Nearshore	WA/OR	0	*Lisa Marie*
305	305.2N	44.50039	-124.184318	Nearshore	WA/OR	-52	*Lisa Marie*
306	306.1N	44.58421	-124.081368	Nearshore	WA/OR	5	*Lisa Marie*
306	306.2N	44.583698	-124.169882	Nearshore	WA/OR	-52	*Lisa Marie*
307	307.1N	44.667458	-124.081462	Nearshore	WA/OR	-4	*Lisa Marie*
307	307.2N	44.666895	-124.177636	Nearshore	WA/OR	-51	*Lisa Marie*
308	308.1N	44.750757	-124.076093	Nearshore	WA/OR	-5	*Lisa Marie*
308	308.2N	44.750202	-124.169517	Nearshore	WA/OR	-63	*Lisa Marie*

309	309.1N	44.834088	-124.068279	Nearshore	WA/OR	-4	*Lisa Marie*
309	309.2N	44.833508	-124.16463	Nearshore	WA/OR	-63	*Lisa Marie*
310	310.1N	44.917585	-124.03636	Nearshore	WA/OR	-1	*Lisa Marie*
310	310.2N	44.917007	-124.13109	Nearshore	WA/OR	-58	*Lisa Marie*
311	311.1N	45.000993	-124.022697	Nearshore	WA/OR	-1	*Lisa Marie*
311	311.2N	45.000442	-124.111751	Nearshore	WA/OR	-68	*Lisa Marie*
312	312.1N	45.084373	-124.016542	Nearshore	WA/OR	-10	*Lisa Marie*
312	312.2N	45.083774	-124.112194	Nearshore	WA/OR	-78	*Lisa Marie*
313	313.1N	45.167982	-123.977398	Nearshore	WA/OR	44	*Lisa Marie*
313	313.2N	45.167391	-124.070657	Nearshore	WA/OR	-62	*Lisa Marie*
314	314.1N	45.251364	-123.977493	Nearshore	WA/OR	22	*Lisa Marie*
314	314.2N	45.250763	-124.071067	Nearshore	WA/OR	-67	*Lisa Marie*
315	315.1N	45.33454	-124.012299	Nearshore	WA/OR	-33	*Lisa Marie*
315	315.2N	45.333958	-124.101683	Nearshore	WA/OR	-89	*Lisa Marie*
316	316.1N	45.418227	-123.971326	Nearshore	WA/OR	-1	*Lisa Marie*
316	316.2N	45.417578	-124.069957	Nearshore	WA/OR	-72	*Lisa Marie*
317	317.1N	45.501645	-123.974711	Nearshore	WA/OR	30	*Lisa Marie*
317	317.2N	45.501008	-124.070309	Nearshore	WA/OR	-74	*Lisa Marie*
318	318.1N	45.585174	-123.964486	Nearshore	WA/OR	0	*Lisa Marie*
318	318.2N	45.584547	-124.057492	Nearshore	WA/OR	-67	*Lisa Marie*
319	319.1N	45.668783	-123.945706	Nearshore	WA/OR	25	*Lisa Marie*
319	319.2N	45.66814	-124.039916	Nearshore	WA/OR	-61	*Lisa Marie*
320	320.1N	45.752036	-123.981946	Nearshore	WA/OR	-19	*Lisa Marie*
320	320.2N	45.751353	-124.080841	Nearshore	WA/OR	-74	*Lisa Marie*
321	321.1N	45.835615	-123.973464	Nearshore	WA/OR	-1	*Lisa Marie*
321	321.2N	45.835019	-124.058793	Nearshore	WA/OR	-65	*Lisa Marie*
322	322.1N	45.919027	-123.991874	Nearshore	WA/OR	-15	*Lisa Marie*
322	322.2N	45.918343	-124.088604	Nearshore	WA/OR	-74	*Lisa Marie*
323	323.1N	46.002946	-123.941661	Nearshore	WA/OR	0	*Lisa Marie*
323	323.2N	46.002049	-124.067304	Nearshore	WA/OR	-63	*Lisa Marie*
324	324.1N	46.086462	-123.951421	Nearshore	WA/OR	-10	*Lisa Marie*
324	324.2N	46.085784	-124.045275	Nearshore	WA/OR	-39	*Lisa Marie*
325	325.1N	46.169778	-123.991379	Nearshore	WA/OR	-11	*Lisa Marie*
325	325.2N	46.168976	-124.101206	Nearshore	WA/OR	-39	*Lisa Marie*
326	326.1N	46.252937	-124.05462	Nearshore	WA/OR	-6	*Lisa Marie*
326	326.2N	46.252024	-124.178205	Nearshore	WA/OR	-35	*Lisa Marie*
327	327.1N	46.33641	-124.077414	Nearshore	WA/OR	-1	*Lisa Marie*
327	327.2N	46.335727	-124.168858	Nearshore	WA/OR	-28	*Lisa Marie*
328	328.1N	46.420128	-124.070273	Nearshore	WA/OR	-5	*Lisa Marie*
328	328.2N	46.41944	-124.161358	Nearshore	WA/OR	-26	*Lisa Marie*
329	329.1N	46.503803	-124.071837	Nearshore	WA/OR	-7	*Lisa Marie*
329	329.2N	46.503119	-124.161574	Nearshore	WA/OR	-27	*Lisa Marie*
330	330.1N	46.587442	-124.080992	Nearshore	WA/OR	-1	*Lisa Marie*

330	330.2N	46.586811	-124.162904	Nearshore	WA/OR	-28	*Lisa Marie*
331	331.1N	46.670485	-124.101442	Nearshore	WA/OR	-7	*Lisa Marie*
331	331.2N	46.669721	-124.206255	Nearshore	WA/OR	-40	*Lisa Marie*
332	332.1N	46.754593	-124.123971	Nearshore	WA/OR	-9	*Lisa Marie*
332	332.2N	46.753993	-124.200301	Nearshore	WA/OR	-39	*Lisa Marie*
333	333.1N	46.838368	-124.124185	Nearshore	WA/OR	-7	*Lisa Marie*
333	333.2N	46.837559	-124.22605	Nearshore	WA/OR	-39	*Lisa Marie*
334	334.1N	46.921686	-124.184418	Nearshore	WA/OR	-8	*Lisa Marie*
334	334.2N	46.920932	-124.278337	Nearshore	WA/OR	-40	*Lisa Marie*
335	335.1N	47.005495	-124.185776	Nearshore	WA/OR	-7	*Lisa Marie*
335	335.2N	47.004795	-124.272136	Nearshore	WA/OR	-32	*Lisa Marie*
336	336.1N	47.089259	-124.195772	Nearshore	WA/OR	-2	*Lisa Marie*
336	336.2N	47.088587	-124.277807	Nearshore	WA/OR	-28	*Lisa Marie*
337	337.1N	47.172975	-124.214299	Nearshore	WA/OR	-1	*Lisa Marie*
337	337.2N	47.172269	-124.299718	Nearshore	WA/OR	-33	*Lisa Marie*
338	338.1N	47.256629	-124.243024	Nearshore	WA/OR	-1	*Lisa Marie*
338	338.2N	47.255617	-124.364218	Nearshore	WA/OR	-33	*Lisa Marie*
339	339.1N	47.339954	-124.3132	Nearshore	WA/OR	7	*Lisa Marie*
339	339.2N	47.339087	-124.416172	Nearshore	WA/OR	-33	*Lisa Marie*
340	340.1N	47.423594	-124.348134	Nearshore	WA/OR	20	*Lisa Marie*
340	340.2N	47.422861	-124.434343	Nearshore	WA/OR	-21	*Lisa Marie*
341	341.1N	47.507425	-124.363321	Nearshore	WA/OR	0	*Lisa Marie*
341	341.2N	47.506688	-124.449111	Nearshore	WA/OR	-20	*Lisa Marie*
342	342.1N	47.591207	-124.386839	Nearshore	WA/OR	-6	*Lisa Marie*
342	342.2N	47.59045	-124.474211	Nearshore	WA/OR	-22	*Lisa Marie*
343	343.1N	47.674926	-124.420301	Nearshore	WA/OR	-4	*Lisa Marie*
343	343.2N	47.674129	-124.511408	Nearshore	WA/OR	-22	*Lisa Marie*
344	344.1N	47.758471	-124.475953	Nearshore	WA/OR	-1	*Lisa Marie*
344	344.2N	47.757328	-124.605361	Nearshore	WA/OR	-28	*Lisa Marie*
345	345.1N	47.841793	-124.558723	Nearshore	WA/OR	2	*Lisa Marie*
345	345.2N	47.840427	-124.712013	Nearshore	WA/OR	-37	*Lisa Marie*
346	346.1N	47.925022	-124.65344	Nearshore	WA/OR	-2	*Lisa Marie*
346	346.2N	47.924134	-124.752178	Nearshore	WA/OR	-34	*Lisa Marie*
347	347.1N	48.008748	-124.694755	Nearshore	WA/OR	-1	*Lisa Marie*
347	347.2N	48.007964	-124.781255	Nearshore	WA/OR	-33	*Lisa Marie*
348	348.1N	48.092793	-124.703629	Nearshore	WA/OR	-4	*Lisa Marie*
348	348.2N	48.091872	-124.80433	Nearshore	WA/OR	-34	*Lisa Marie*
349	349.1N	48.176669	-124.733852	Nearshore	WA/OR	-9	*Lisa Marie*
349	349.2N	48.17574	-124.834461	Nearshore	WA/OR	-45	*Lisa Marie*
350	350.1N	48.261231	-124.692959	Nearshore	WA/OR	-1	*Lisa Marie*
350	350.2N	48.260192	-124.8045	Nearshore	WA/OR	-34	*Lisa Marie*
351	351.1N	48.345249	-124.713761	Nearshore	WA/OR	0	*Lisa Marie*
351	351.2N	48.344192	-124.826404	Nearshore	WA/OR	-56	*Lisa Marie*

Summary of the Coastal Pelagic Species Nearshore Survey Activities

A collaboration with the Washington Department of Fish and Wildlife, West Coast Pelagic Conservation Group, and Southwest Fisheries Science Center

Summer 2022

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Coastal Marine Fish Biologist

Introduction

Within the California Current Ecosystem (CCE), coastal pelagic species (CPS) comprise a large portion of the available forage fish assemblage and historically supported a thriving commercial fishery. Populations of these fish are typically highly variable with ranges that can expand and contract dramatically, with abundance and distribution tightly linked to ocean conditions. These fishes serve as vital sources of food for other fish species, birds, and marine mammals.

In 2017 the West Coast Pelagic Conservation Group (WCP), a Pacific Northwest industry consortium, partnered with NOAA Southwest Fisheries Science Center (SWFSC) to conduct a "proof-of-concept" acoustic-seine surveillance of nearshore CPS assemblage. The goal was to complement the NOAA SWFSC CCE Survey by outfitting the *F/V Lisa Marie* with a Simrad EK60 to acoustically sample transects in waters inaccessible to the NOAA research vessel *Reuben Lasker*. Success of the 2017 survey led to surveys in 2019 and 2021 with expansion of spatial coverage from Washington and Oregon to include northern California and onboard biological and species composition sampling by Washington Department of Fish and Wildlife (WDFW) biologists.

After three years of successful survey work, the *Lisa Marie* was outfitted with a new hull mounted transducer blister to move closer to the end goal of an array of four wide-bandwidth transducers for optimal acoustic surveying. The final two transducers are currently planned to be installed in the fall of 2022 to be complete prior to the 2023 survey. Due to staffing complications aboard the *Reuben Lasker*, the original plan of surveying the nearshore waters (0-5nm) from Cape Flattery, WA to Bodega Bay, CA from July – August 5th was changed a week prior to the departure of the *Lisa Marie* to include all waters and every compulsory transect line (**Figure 1**) departing from Westport on July 5, 2022.

Objectives

1. Estimate distributions and abundances of CPS, particularly the northern and central sub-populations of Northern Anchovy, Pacific Sardine, Jack Mackerel, Pacific Mackerel, and Pacific Herring in the California Current Ecosystem.
2. Continuously sample acoustic backscatter during daylight hours (sunrise to sunset).
3. Set on fish near the sea surface using purse seine gear at three to four locations a day when fish are seen while transecting acoustic lines.
4. Collect species compositions from three baskets of fish collected from the overall catch and biological data (length, weight, sex, maturity, age structures) from priority species (**Table 1**) and all other species collected as time allows.

Methods

Timing

This survey was completed between July 5 and August 4, 2022 (Table 2).

Locations

A total of 33 compulsory transect lines were completed from Cape Flattery, WA to Bodega Bay, CA (Figure 1). These lines ranged in length from 25 to 65 nautical miles. The shortest line was cut short by the Canadian border and the longest line resulted in the presence of fish schools near the offshore end of the line. Most transect lines averaged 45 nautical miles in length and were 20 nautical miles apart.

Vessel and Staff

The *F/V Lisa Marie*, a 78.5 foot steel hull commercial fishing vessel captained by Rick Blair was used for the entirety of this survey. In addition to Rick, the *Lisa Marie* employs two deckhands who man the purse seine net as it comes aboard and one skiff operator who deploys the net aboard the skiff. The crew for the 2022 survey were deckhands Dave Yokum and Chase Lerner, and skiff operator Dino Thomas.

Onboard WDFW staff included Kristen Hinton, Erin Jaco, Emily Seubert, and Zac Calef.

Andy Blair, president of West Coast Pelagic Conservation Group, Mike Okoniewski, secretary of the West Coast Pelagic Conservation Group, and Greg Shaughnessy, vice president of West Coast Pelagic Conservation Group and chief operating officer of Ocean Gold Seafoods were also integral in the permitting and planning processes for this survey (Figure 2).

Gear

The principal acoustic gear includes Simrad EK 80 Wide Bandwidth Transceivers connected to hull mounted Simrad 38 kHZ (ES38-7C) and 200kHz (ES200-7C) transducers.

The purse seine net used for enumerating the acoustic backscatter from the above acoustic gear is approximately 440m long and 40m deep with a 17mm wide mesh. The purse seine is set off the rear of the vessel via a skiff and hauled on the starboard side of the vessel while the skiff stands by on the port side (**Figure 3** and **Figure 4**).

Effort

All acoustic lines and purse seine sets were completed during day light hours (between sunrise and sunset). Acoustic transect lines were ran in a straight line either East to West or West to East at approximately 7 knots and deviations were kept to a minimum.

Data Collection

Effort Data

Acoustic information was collected continuously via the Simrad EK80 software and Matlab programing written by SWFSC. These data were logged to an external hard drive and backed up automatically every five minutes to a separate hard drive.

A paper logbook detailing the location, time, depth, and sea surface water temperature of the beginning and end of each transect line was kept for the duration of the survey. Any pause in the line, deviation from the line, or stop to set was documented, as well as the continuation of the transect line. Each sets time, location, depth, temperature, and hail weight were documented in the paper logbook as well as within the Rose Point Coastal Explorer .nob file of transect lines provided by SWFSC. Also, within this .nob file, tracks were ran while transiting the transect lines to better error check the EK80 files GPS locations throughout the entirety of the survey.

Catch and Biological Data

Total catch weight was enumerated by the vessels captain and written with the set information for each set.

From each set, three baskets of one brailer net scoop each, separated spatially as much as possible from the seine net were kept while the rest of the seine net was released unharmed

(Figure 5). Each basket was individually sorted to species, enumerated, and weighed. Upon all fish being counted and weighed, 50 fish from each species were randomly selected for biological information. From each fish selected, length (standard length for Northern Anchovy and Pacific Sardine, fork length for all others), individual weight, and sex were collected. For all CPS (Table 1) and groundfish, maturity and age structures (except for Pacific Herring) were also collected.

Data Flow

All fishing effort, catch, and biological information were collected on paper and later transcribed into a Microsoft Excel spreadsheet. All biological information were also transcribed into WDFW's inhouse Biological Data System (BDS) where age structures can be tracked, and age readers are able to input ages when structures are read. All acoustic data were saved directly to a hard drive which was backed up to a secondary hard drive every five minutes throughout the entirety of the survey.

Age structures were delivered to the WDFW ageing lab and ages will be provided to SWFSC upon availability.

All acoustic, set, biological, and species composition data will be shared with SWFSC for analysis.

Results

During the survey timeframe of July 5 through August 4, 2022, 33 transect lines were ran over 23 days (Table 2). Data logging was accidentally turned off for portions of transect lines 131 and 133 on July 27th. Due to the timing of the incident, it was advised that the vessel continue along the transect lines as scheduled and return to those portions during the transit back to Westport.

A total of 41 sets were made over the entirety of the survey (Figure 1 and Table 3). From these sets, a total of 28 different species were identified, counted, and weighed for a total count of 6197.5 individuals at a total of 232.7872kg (Table 4). Of the individually identified species, biological information was taken from 21 of them. A total of 1276 individual lengths, 1270 weights, 1160 sexes, 684 maturities, and 684 age structures were taken (Table 5). Of these 1276 individuals, 797 were from the priority species list (Table 1). Four species managed in the CPS Fishery Management Plan were collected for biological sampling; of these a total of 0.012mt of Jack Mackerel, 0.026mt of Northern Anchovy, 0.004mt of Pacific Mackerel, and 0.089mt of Pacific Sardine were collected for species compositions and biological data collections. Locations of sets with priority species can be seen in Figure 6.

All data will be sent to SWFSC for further analysis and any analyses can be found in their Technical Memorandum describing the distribution, biomass, and demography of CPS in the CCE.

Tables

Table 1. Priority species list.

Priority Species
Jack Mackerel
Market Squid
Northern Anchovy
Pacific Herring
Pacific Mackerel
Pacific Sardine

Table 2. Survey dates and transect lines. *Lines 133 and 131 were partially ran with acoustic data logging turned off on July 27th, those sections were re-ran on August 2nd.

Date	First Transect	Last Transect
7/5/2022	Leave Westport	Transit
7/6/2022	178	177
7/7/2022	175	173
7/8/2022	173	171
7/9/2022	169	167
7/10/2022	167	Return to Port
7/11/2022	165	163
7/12/2022	Anchored	Anchored
7/13/2022	163	161
7/14/2022	159	157
7/15/2022	157	155
7/16/2022	In Port	In Port
7/17/2022	153	151
7/18/2022	151	149
7/19/2022	147	In Port
7/20/2022	145	143
7/21/2022	141	139
7/22/2022	137	In Port
7/23/2022	In Port	In Port
7/24/2022	In Port	In Port
7/25/2022	In Port	In Port
7/26/2022	135	135
7/27/2022	133*	131*
7/28/2022	128	126
7/29/2022	126	124
7/30/2022	122	120
7/31/2022	118	116
8/1/2022	114	114
8/2/2022	131*	133*
8/3/2022	Transit	Transit
8/4/2022	Transit	Return to Westport

Table 3. Number of sets per day.

Date	Number of Sets
7/6/2022	3
7/7/2022	3
7/8/2022	2
7/9/2022	3
7/10/2022	2
7/11/2022	1
7/13/2022	3
7/14/2022	4
7/15/2022	3
7/17/2022	3
7/19/2022	1
7/20/2022	1
7/21/2022	3
7/26/2022	2
7/27/2022	2
7/29/2022	1
7/31/2022	2
8/1/2022	2

Table 4. Total catch taken for species compositions.

Species	Total Count	Total Weight (kg)
Chinook Salmon	1	0.013
Ctenophore		1.1635
Egg Jelly	2	0.682
Eulachon	1	0.012
Jack Mackerel	29	12.241
King of the Salmon	1	0.105
Moon Jellyfish	1	1.6115
Northern Anchovy	1244	26.1705
Pacific Herring	706	20.228
Pacific Mackerel	7	4.126
Pacific Sanddab	4	0.3505
Pacific Sardine	1225	88.5925
Pacific Saury	1451	22.779
Pacific Tomcod	4	0.0355
Pacific Whiting (Hake)	14	3.4235
Polyorchis Pencillatus	142	0.755
Pyrosome	161	0.345
Sea Elephant	110	1.5505
Sea Nettle	18	11.0195
Spiny Dogfish	21	3.7725
Starry Flounder	1	0.054
Surf Smelt	70	1.818
Unidentified Ctenophore	4	0.684
Unidentified Gadidae	1	0.0005
Unidentified Smelt	8	0.008
Water Jellyfish	250.5	8.2192
Whitebait Smelt	699	3.4845
Widow Rockfish	22	19.5385

Table 5. Counts of biological data taken by species.

Species	Count of Lengths	Count of Weights	Count of Sexes	Count of Maturities	Count of Age Structures
Eulachon	1	1	1		
Flathead Sole	1	1	1		
Jack Mackerel	28	28	28	28	28
King of the Salmon	1	1			
King Salmon	1	1			
Northern Anchovy	160	160	160	160	160
Pacific Herring	157	157	156		
Pacific Mackerel	7	7	7	7	7
Pacific Sanddab	4	4	4	2	2
Pacific Sardine	445	445	445	443	443
Pacific Saury	239	239	239		
Pacific Tomcod	4		4	4	4
Pacific Whiting (Hake)	18	18	18	18	18
Spiny Dogfish	21	21	21		
Starry Flounder	2	2	2		
Surf Smelt	52	52	52		
Unidentified Greenling	2	2			
Unidentified Smelt	10	8			
Whitebait Smelt	100	100			
Widow Rockfish	22	22	22	22	22
Wolf-Eel	1	1			

Figures

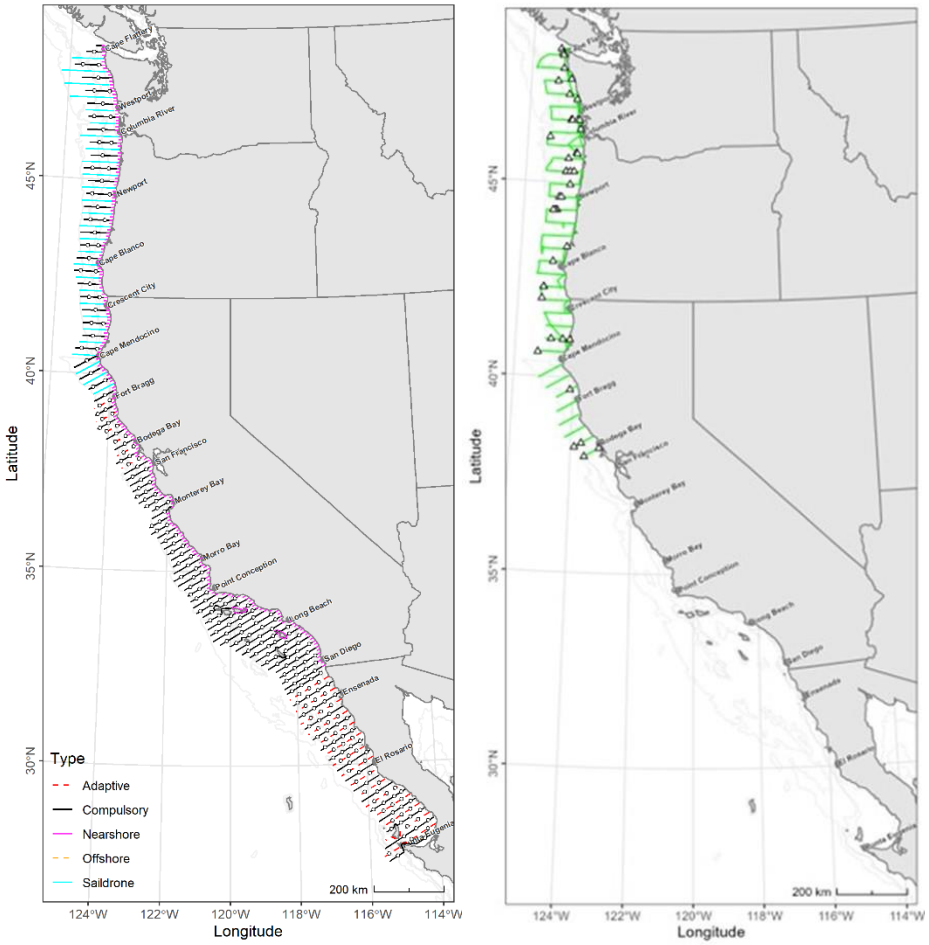

Figure 1. Planned transect lines for the entirety of the California Current Ecosystem Survey(left) and *Lisa Marie's* completed transect lines (right). Completed lines south of Crescent City, CA are replicas of the planned lines due to unforeseen GPS issues. Triangles in the right figure show locations of completed purse seine sets. (Figures courtesy of Kevin Stierhoff, SWFSC).

Figure 2. Vessel Crew, WDFW biologists, and Industry partners pictured in front of the *F/V Lisa Marie* before departure from Westport, WA. Back row from left to right, Greg Shaughnessy, Rick Blair, Mike Okoniewski, Dino Thomas, Chase Lerner, Dave Yokum, Lorna Wargo; front row from left to right Erin Jaco, Emily Seubert, Kristen Hinton, Theresa Tsou (missing from photo: Zac Calef and Andy Blair).

Figure 3. Purse seine being hauled in along the starboard side of the *Lisa Marie*.

Figure 4. View of the *Lisa Marie* from the skiff while gear is being hauled in.

Figure 5. Brailer net being taken from the overall purse seine catch for species composition and biological information.

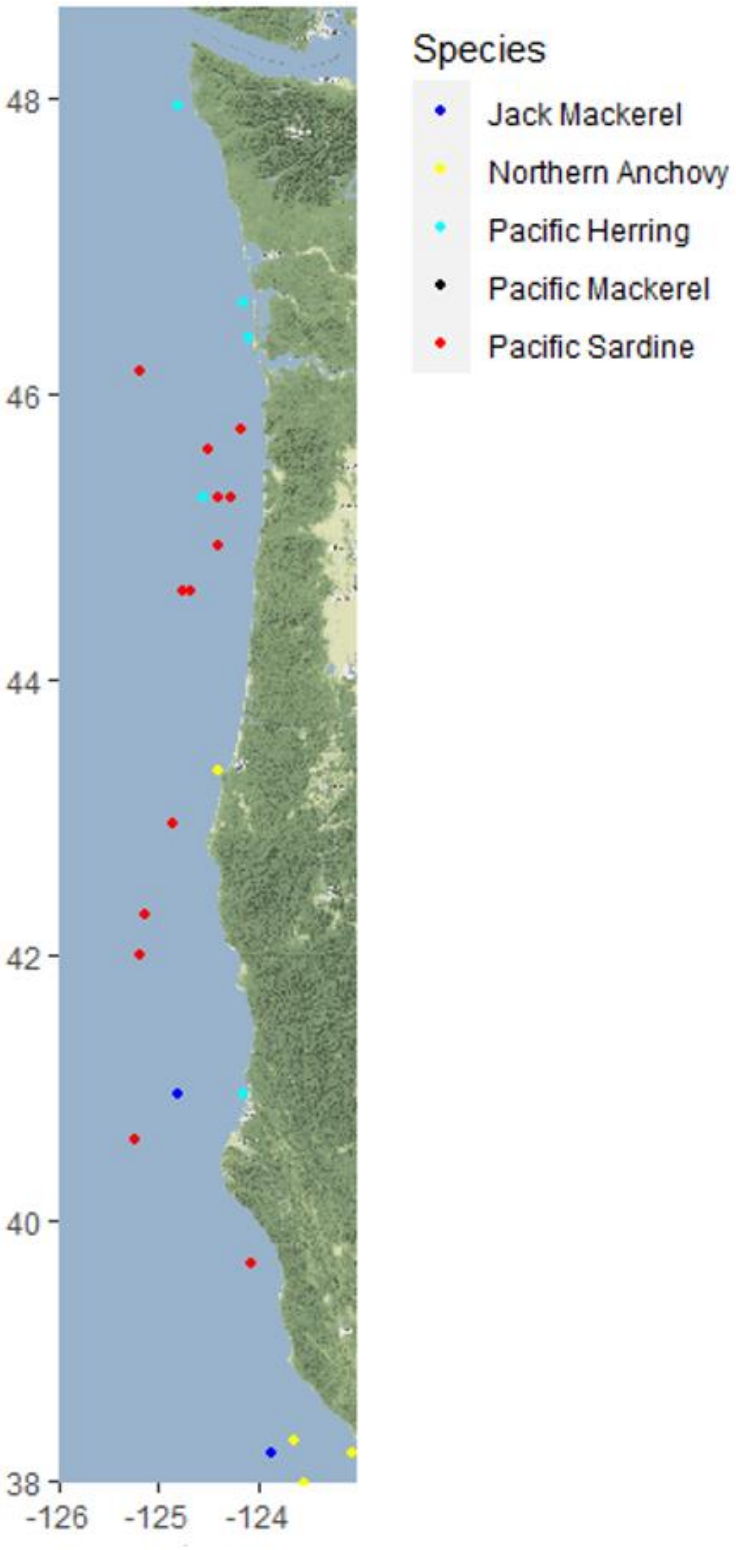

Figure 6. Locations of sets with priority species.